

AUDIENCE SATISFACTION AMONG TIVO AND REPLAYTV USERS

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ABSTRACT: This study explores how early adopters of DVRs are using them as functional replacements for VCRs and as tools for enhanced viewing of live television. Two national samples totaling 198 users completed an online survey that measured TV uses and gratifications, viewing satisfaction, and attitudes toward DVR functions. DVR owners reported watching television, live and recorded, with more enjoyment and greater control. TiVo owners in the second sample noted a higher degree of satisfaction than in the first sample.

From a functional point of view, the evolution of the television viewing experience has been slow. Since the first fundamental design of the television set, there have been few enhancements to actual use that go beyond the basic functions (on/off, channel change, volume control, etc.). But the advent of the digital video recorder (DVR), also known (increasingly less frequently) as the personal video recorder (PVR), may represent a revolution in TV functionality that may forever change the way most people watch television. Expanding on an earlier examination of the features of DVRs (Ferguson and Perse 2001), the specific purpose of this study is to examine the uses and functions of the DVR with regard to increased satisfaction of television viewing by DVR owners.

BACKGROUND

Bold claims have surfaced before, notably when the analog videocassette recorder (VCR) promised viewers the ability to time-shift the program schedule. In reality, the VCR's other main function (playing/pausing/fast-searching recorded tapes) took precedence, thanks to the widespread availability of inexpensive tape rentals. Klopfenstein (1989) found that most VCR users viewed the time-shifting function as only occasionally useful. The VCR requires more effort for time-shifting than many owners care to expend.

Other attempts to enhance the functionality of the television set have been studied. The remote control device moved the usual functions of the VCR and TV closer to the user and greatly sped up the selection process, a momentous change for viewers, but did not add new functionality beyond the last-channel button and the mute button (Eastman and Newton 1995). Picture-in-picture capability allowed the viewer to watch two or more shows at once, but the remote control could often flip between shows just as easily. After the advent of digital capabilities like the Internet and two-way cable, interactive features have permitted the user to select different

streams "on demand" and create an asynchronous viewing experience in real-time.

The key to understanding the added functionality of the DVR is the asynchronous nature of the recordings (Negroponte 1995). Unlike the ordinary VCR that uses videocassette tape, the DVR uses a hard-disk to store compressed video, thus allowing simultaneous recording and playback of the same program without regard to linear time. For example, the DVR allows a viewer to record an hour-long program while watching live a half-hour program, and then immediately begin watching the recorded show from the beginning, even while the remaining minutes of the show are still being recorded. Many DVR owners have reported being able to watch the same number of shows in less time, because they can watch any archived program while other shows are being recorded. The concept of "real time" is controlled by the user and TiVo is able to measure its subscribers' use of replay during daily transfer of program data. In the 2004 Super Bowl, for example, many viewers replayed commercials instead of skipping them, but a new record for replay activity was set immediately following Janet Jackson's half-time appearance.

Even when not instructed to make a recording, the DVR is always recording the current channel onto its hard-drive buffer. Thus, the user can pause live TV or ask for instant-replays. The pause feature on recorded programs has been particularly useful when the viewing experience is interrupted by a phone call or some other intrusion, but now the pause can take place during live shows in progress.

Another key distinction between the VCR and the DVR is the hassle-free selection of shows. DVRs feature a choice of two menu systems: (1) an IPG (interactive program guide), which is a searchable menu of programs, alphabetized or sorted by time and genre, and (2) an EPG (electronic program guide), which is an overlay program schedule to consult during live TV (much like that found on digital cable systems). Every

DVR is connected to a centralized computer database via a telephone connection over which the program schedules are downloaded or updated daily.

Either system of program menus is available to the viewer who decides the following: (1) which shows to record, (2) how long to store recordings, (3) what picture quality is needed (lower quality increases storage capability), and (4) how often to record (a "season pass" records all programs of a given title without regard to fluctuations in scheduling). If a viewer decides not to watch an archived show, there is no need to rewind the tape because the show is automatically deleted after a certain interval (usually two days).

RESEARCH QUESTIONS

What is not known about DVRs is how all these additional functions are affecting the way that viewers are using television. Early studies of the standalone VCR described how viewers were using them for time-shifting (Levy 1980, 1981, 1983). One can assume that proprietary consumer research was done to decide which DVR features would be popular, but no studies have been released that show how the features are actually being used. Our first question, then, was:

RQ1: How do TiVo and ReplayTV owners use the various DVR functions?

Second, it would be interesting to know if DVR owners report any substantial changes in their behavior or their attitudes toward watching TV with added functionality. Perse and Courtright (1993) found that media users select among functional alternatives, or media that can fill similar goals. Just as cable television and VCRs both became functional alternatives to broadcast television, the DVR may be a functional replacement to the VCR. The second research question of this study became:

RQ2: Is the DVR a functional replacement to the VCR?

Next, we sought to examine what non-archival functions DVRs offer viewers during live television shows. It would be useful to see if viewers take full advantage of the features that allow manipulation of real-time, and whether they detect a difference in their viewing habits. Our third research question, then, was:

RQ3: Does the use of a DVR increase the benefits of "enhanced" television viewing?

Furthermore, we wanted to know if any of these functions are related to traditional uses and gratifications "motivation"

variables (e.g., Rubin 1984) and to standard measures of viewing benefits and viewer satisfaction (Perse and Ferguson 1993, 2000). The final research question became:

RQ4: Is viewing satisfaction linked to the use of DVR functions?

METHOD

The number of persons who own standalone DVRs was estimated at fewer than 300,000 in September 2001, more than two years after the introduction of the two dominant brands, TiVo and ReplayTV. A random sample was deemed impractical for obtaining enough participants, as there are too few owners. Early VCR research (e.g., Levy 1983) used convenience samples for the same reason. Because this was also an exploratory study, a self-selected sample of DVR owners completed an anonymous online survey at: <http://www.cofc.edu/~ferguson/survey.htm>.

The sample was composed of those early DVR adopters who participate in the TiVo web forum site and the ReplayTV web forum site at <http://www.avforum.com> on the Internet. Forum participants were invited to complete the survey for the purposes of academic research.

Over a 4-week period in October 2000, a total of 121 DVR owners completed the survey. TiVo owners accounted for 75 (62.0%) completed surveys and ReplayTV owners comprised the remaining 46 (38.0%). A second wave of respondents completed a similar survey during October 2001, producing an additional 77 DVR owners. In the second wave, TiVo owners accounted for 58 (75.3%) completed surveys and ReplayTV owners comprised the remaining 19 (24.7%).

DVR Use and Functions

Respondents answered several questions about their DVR. Most owners (48.3%) owned DVRs with 30-hour storage; another 11.7% owned 14-hour DVRs. Just over 28% (28.3%) owned DVRs that recorded for more than 30 hours. TiVo and ReplayTV owners did not differ on storage capacity: $t(118) = 0.96$, $p = .49$. Most owners (72.0%) paid for life-time subscriptions for associated program services. Another 26.9% paid monthly. Only 1.9% paid for program services annually. Because ReplayTV's initial cost includes a lifetime subscription, there were expected differences in subscription fee payment. TiVo owners were less likely to pay with a lifetime subscription: $t(105) = 3.96$, $p < .001$. Owners generally found their DVRs easy to install ($M = 6.72$, $SD = 1.79$, where 0 = very difficult to install,

8 = very easy). TiVo and ReplayTV owners did not differ in how difficult they found installation: $t(119) = 0.33, p = .74$.

Owners also completed a set of 9-point Likert-type statements about their use of the various DVR functions. These items asked how often (0 = never, 8 = always) they paused live programs, recorded and watched programs scheduled at inconvenient times, used on-screen interactive program guides (IPGs) to select programs to watch, used electronic on-screen schedules (EPGs) to choose programs to record, fast-forwarded past commercials, fast-forwarded past unwanted program segments, fast-forwarded past unwanted people, used the instant-replay button, programmed the DVR to recognize types of shows/programs they liked, and used the slow-motion button. Using the same format, we asked how often owners used four brand-specific features: ReplayTV Skip 30 (this function moves the program ahead 30 seconds), TiVo Suggestions (a menu option that displays a personalized list of the programs that might be interesting to the viewer, based on their use of the Thumbs feature), TiVo Thumbs (a teaching function that displays programs and lets the viewer rate it "Thumbs up" or "Thumbs Down"), and TiVo Showcase (a menu option that includes network promotions for their programs).

DVR as VCR

Respondents completed several questions about their use of their DVR for VCR-like functions. These questions asked how often they recorded programs with the DVR (0 = never, 8 = always), whether they found recording programs with the DVR easier than with the VCR (0 = disagree, 8 = agree), whether they record more programs now with the DVR than before with only the VCR, and whether they transfer programs to more permanent storage on a VCR.

Perceptions about Enhanced Television Viewing

Several survey questions assessed DVR owners' perceptions about how their television viewing has changed. These nine-point Likert-type items (0 = disagree, 8 = agree) included if they feel greater control with the DVR, if they do less channel surfing with the DVR, and if they are less likely to watch commercials with the DVR.

Several sets of questions focused on the benefits of watching television with the DVR. First, respondents indicated their agreement with the statement "I find watching TV more enjoyable with my DVR than before I started using one" (0 = disagree, 8 = agree). Respondents also completed three questions about how satisfied they are with television viewing

(Perse and Ferguson 1993, 2000). Satisfaction items were: "How valuable did you find your television viewing in the past week," "How pleasing was your television viewing during the past week," and "How satisfied were you with your television viewing during the past week." All items used nine-point response options. Responses to these three questions were summed to create a television satisfaction score. Television satisfaction ranged from 0.0 to 24.0 ($M = 14.37, SD = 4.18, \alpha = .86$).

Finally, we asked respondents about the specific benefits they derive from television viewing. These five benefits focused on the most common ritualistic and instrumental uses of television (e.g., Rubin, 1984) and have been used in prior research on soap operas and television satisfaction (Perse and Ferguson, 1993, 2000; Perse and Rubin, 1988). Respondents indicated their agreement (0 = disagree, 8 = agree) with five statements about receiving learning ($M = 4.28, SD = 2.40$), pastime ($M = 4.45, SD = 2.17$), relaxation ($M = 4.95, SD = 2.19$), entertainment ($M = 5.71, SD = 1.90$), and arousal ($M = 2.56, SD = 2.24$) benefits from watching television.

Statistical Analysis

We answered the study's research questions using three basic statistical techniques. We used descriptive statistics to assess the importance of various DVR features and paired t -tests to identify any significant differences among the use of those features. We used descriptive statistics to explore if the DVR is being used in ways that might displace use of the VCR. Finally, we used descriptive statistics to explore how satisfied DVR owners were with their television viewing. Then, we used Pearson correlations to explore how the use of different DVR features was linked to enjoyment of watching television, satisfaction with television viewing, and specific benefits derived from watching television.

RESULTS

Demographics

Respondents were overwhelmingly male (104, with 15 females and two missing). Age ranged from 14 to 59 ($M = 37.43, SD = 10.30$). The sample was well educated. The greatest proportion had completed college or some education beyond college (60.9%).

Television Viewing

Respondents were asked how many minutes they watched television yesterday morning, yesterday afternoon, and last night. The average minutes of TV watched per day (summed

from these three measures) ranged from 0 to 900 minutes ($M = 242.95$, $SD = 173.22$). Near the time of the first data collection, Nielsen (2000) estimated 241.86 minutes per day per average person (236.14 minutes for men age 25 to 54, which more closely matches our male-dominated sample). Total viewing excluding female DVR users averaged 255.85 minutes ($SD = 183.39$). Thus, male DVR owners watch slightly more television than average male adult viewers without DVRs.

Comparisons of Samples

The data presented below in Tables 1 and 2 summarize the findings for the first wave of DVR respondents in October 2000 (n=121). Variable means from the additional 77 respondents was compared with the original respondents using *t*-tests, but there were very few significant differences (e.g., stronger gratifications obtained). Satisfaction, however, was greater for TiVo owners in the second wave ($M = 5.55$) than in the first wave ($M = 5.00$), representing a statistical difference where $p = 0.015$ ($df = 131$). The new data (n=198) was used for the correlations presented in Table 3.

Functions of the DVR

Our first research question asked about DVR owners' use of DVR functions. Means for each function are presented in Table 1.

Table 1: Features of DVRs. Means and Correlations with Television Viewing Satisfaction

Benefits	DVR Features									
	Zip	Record Inconvenient Show	IPG	EPG	FF Program	Pause	Teach	Replay	FF People	SlowMo
Enjoyable	.29**	.52**	.07	.35**	.31**	.30**	.27**	.34**	.20*	.13
Satisfaction	.23*	.41**	.24**	.27**	.19*	.31**	.31**	.15	.13	.06
Learn	.01	.20*	.10	.23*	.08	.22*	.18	.11	.16	.11
Pastime	.00	.24**	.22*	.32**	.04	.08	.17	-.04	.04	-.11
Relax	.06	.28**	.16	.15	.17	.17	.32**	.13	.19*	-.09
Entertain	.19*	.35**	-.03	.15	.14	.20*	.24*	.14	.13	-.13
Arousal	.12	.18*	.16	.29**	.12	.28**	.16	.11	.16	-.07
M	7.27 _a	7.17 _a	6.73	6.18 _b	6.07 _b	5.57 _c	5.40 _{cd}	5.25 _{cd}	5.00 _{de}	3.37
SD	1.11	1.10	1.72	2.23	2.02	2.22	2.72	2.31	2.69	2.24

Note. Means with common subscripts do not differ significantly by paired *t*-tests. ** $p < .01$, * $p < .05$.

The most widely used DVR functions were using it to fast-forward past commercials ($M = 7.27$, $SD = 1.11$) and to record and watch programs scheduled at inconvenient times ($M = 7.17$, $SD = 1.1$). Use of these two functions was not significantly different from each other, but they were significantly more commonly used than any of the other eight functions. The next most used DVR function was the on-

screen schedule for choosing programs to record ($M = 6.73$, $SD = 1.72$). It was significantly more used than the remaining seven functions. The next most used functions were the use of the on-screen program guides ($M = 6.18$, $SD = 2.23$) and using the DVR to skip over unappealing program segments ($M = 6.07$, $SD = 2.02$). Use of these two functions did not differ significantly, but both were used significantly more often than the remaining five. Using the DVR to pause live programming ($M = 5.57$, $SD = 2.22$), to teach program preferences ($M = 5.40$, $SD = 2.72$), and replay program segments ($M = 5.25$, $SD = 2.31$) were the next most widely used functions. The amount of their use was not significantly different. Next, owners reported using the DVR to fast-forward past unappealing people ($M = 5.00$, $SD = 2.69$). This use was significantly lower than the use of the DVR for pausing live programs, but was not significantly different than using the teach or replay functions. The slow-motion function was the least used function ($M = 3.37$, $SD = 2.24$). Its mean was significantly lower than all the other functions.

Of the brand-specific features, ReplayTV's Skip 30 button was used quite often (See Table 2, $M = 7.46$, $SD = 0.99$). TiVo suggestions was also somewhat widely used ($M = 5.45$, $SD = 2.23$) as was the TiVo Thumbs feature ($M = 5.07$, $SD = 2.12$). The TiVo Showcase, however, was not particularly well used ($M = 3.16$, $SD = 2.36$). TiVo owners used the Showcase feature significantly less than the Suggestions feature ($t[73] = 6.99$, $p < .001$) and the Thumbs feature ($t[73] = 5.40$, $p < .001$).

Table 2: Specific Brand Features. Means and Correlations with Viewing Satisfaction

Benefits	Brand Features			
	ReplayTV Skip30	TiVo Suggestions	TiVo Thumbs	TiVo Showcase
Enjoyable	-.05	.29*	-.14	.24*
Satisfaction	-.13	.38**	.22	.18
Learn	-.16	.06	.10	.10
Pastime	.14	.21	.06	.23
Relax	-.09	.35**	.25*	.15
Entertainment	-.04	.33**	.02	.23*
Arousal	-.08	.20	.12	.33**
M	7.46	5.45	5.07	3.16
SD	0.99	2.23 _a	2.12 _a	2.36

Note. For TiVo features only, means with common subscripts do not differ significantly. ** $p < .01$, * $p < .05$.

DVR and VCR

The most endorsed function according to DVR owners was using the devices to record and watch programs scheduled at inconvenient times (see above and Table 1). This suggests that, for DVR owners, the DVR might replace the VCR. In order to look at VCR displacement, we explored DVR owners' perceptions about using the DVR for recording. Consistent with the prime use of DVRs recording and watch programs, our sample reported to record programs with the DVR quite often ($M = 7.35$, $SD = 2.31$). In general, DVR owners believe that it is easier to record programs with the DVR and they record more with the DVR ($M = 7.35$, $SD = 1.64$). Moreover, they rarely transfer programs to the VCR for more permanent storage ($M = 2.31$, $SD = 2.23$).

Perceptions about Television Viewing

There is some indication that the DVR has the potential to change people's feelings about television. Our sample reports feeling more in control with their DVR ($M = 7.48$, $SD = 1.34$); they report less channel surfing now that they own a DVR ($M = 6.26$, $SD = 2.49$), and they believe that they are less likely to watch commercials with the DVR ($M = 6.93$, $SD = 1.92$).

Our sample does believe that the DVR makes television viewing more enjoyable ($M = 7.34$, $SD = 1.45$). However, as they report only moderate satisfaction with television viewing ($M = 14.37$, $SD = 4.18$), we explored which DVR functions are linked to greater enjoyment, satisfaction, and benefits of television viewing.

DVR's ability to allow owners to record and watch programs aired at inconvenient times is a feature that is linked to greater satisfaction (see Table 1). This feature is linked to reporting greater enjoyment from watching television ($r = .52$, $p < .01$), to television viewing satisfaction ($r = .41$, $p < .01$), and to all benefits of watching television: learning ($r = .20$, $p < .05$), pastime ($r = .24$, $p < .01$), relaxation ($r = .28$, $p < .01$), entertainment ($r = .35$, $p < .01$), and arousal ($r = .18$, $p < .05$). Using the on-screen program to schedule select programs to record is also linked to greater satisfaction. Use of this feature is positively related to greater enjoyment from television viewing ($r = .35$, $p < .01$), greater television viewing satisfaction ($r = .27$, $p < .01$), receiving greater learning ($r = .23$, $p < .05$), pastime ($r = .32$, $p < .01$), and arousal benefits ($r = .29$, $p < .01$). Using the DVR to pause live programming is also linked to satisfaction. This feature is positively correlated with reporting greater enjoyment with television viewing ($r = .30$, $p < .01$), higher television viewing

satisfaction ($r = .31$, $p < .01$), and greater learning ($r = .22$, $p < .05$), entertainment ($r = .20$, $p < .05$), and arousal benefits ($r = .29$, $p < .01$). Using the teaching function to instruct the DVR to recognize programs preferred by the viewer is also related to greater satisfaction. This feature is linked positively to enjoyment of television viewing ($r = .27$, $p < .01$), viewing satisfaction ($r = .31$, $p < .01$), receiving relaxation ($r = .32$, $p < .01$) and entertainment benefits ($r = .24$, $p < .01$). Other features were linked only modestly to viewing satisfaction. Being able to avoid commercials was linked to greater television viewing enjoyment ($r = .29$, $p < .01$), greater television viewing satisfaction ($r = .23$, $p < .05$), and receiving entertainment benefits from watching television ($r = .19$, $p < .05$). The on-screen program guide feature was linked to greater television viewing satisfaction ($r = .24$, $p < .01$) and receiving pastime benefits from watching television ($r = .22$, $p < .05$). The ability to fast-forward past unwanted program segments was related positively to enjoyment of television ($r = .31$, $p < .01$) and television viewing satisfaction ($r = .19$, $p < .05$). Being able to fast-forward past unwanted people was positively related to enjoyment of television ($r = .20$, $p < .05$) and relaxation benefits ($r = .19$, $p < .05$). The instant-replay function was linked only to greater enjoyment of television ($r = .34$, $p < .01$). The slow-motion function was unrelated to any measures of satisfaction.

Motivations

Table 3 summarizes the relationships between the DVR features and a few key motivational and satisfaction variables. All of the features were more strongly linked to instrumental motivations for using television than to ritualistic motives. For example, zipping commercials was associated with instrumental motives ($r = .20$, $p < .01$) but not to ritualistic motives ($r = .11$, n.s.). Channel repertoire was the only item to which ritualistic motives were related ($r = .15$, $p < .05$), whereas instrumental motives were not ($r = .05$, n.s.). Neither kind of motivation was associated with the use of specific buttons (e.g., instant replay, slow motion, thumbs up/down, skip-30).

Table 3.

Table 3	TV Min	Instrumental	Ritual	Enjoy	Control	Satisfaction
TV Minutes						
Instrumental	.14*					
Ritual	.25**	.32**				
Enjoy	.01	.35***	.16*			
Control	.00	.17*	.13	.54***		
Satisfaction	.10	.61***	.12	.35***	.22**	
Channel Rep	.41**	.05	.15*	-.25**	-.33***	.02
Pause Live	.06	.22**	.09	.19**	.14	.19*
Record Inconv	-.01	.32***	.15*	.42***	.40***	.35***
Use EPG	.15*	.20**	.18*	.27***	.14*	.10
Use IPG	.04	.02	.10	.01	.07	-.02
Teach DVR	.12	.30***	.20**	.18*	.17*	.26***
Read Updates	.12	.33***	.22**	.14	.09	.27***
Trans to VCR	.07	.21**	.03	.05	.00	.20**
Zip Commercial	-.08	.20**	.11	.20*	.24***	.14
Avoid People	.01	.26**	.10	.14	.12	.11
Skip Program	-.07	.22**	.01	.20*	.19*	.19**
Instant Replay	.02	.11	.00	.28***	.13	.13
Slow Motion	.05	.10	.03	.13	-.04	.02
Thumbs	.20*	.16	.11	-.07	-.03	.15
Tivo Suggest	.14	.09	.13	.21*	.16	.11
Tivo Showcase	.14	.27**	.22*	.24**	.20*	.17*
Skip30	-.15	-.09	.14	-.09	.02	-.10
Less Grazing	-.06	.28***	.16*	.30***	.41***	.25***
Fewer Commer	-.02	.04	.11	.30***	.51***	.21**

Note. * $p < .05$, ** $p < .01$, *** $p < .001$.

More significant, our television satisfaction scale was strongly linked to instrumental uses ($r = .61$, $p < .001$) and little ritualistic uses ($r = .12$, n.s.). Satisfaction was also associated with being able to record at inconvenient times ($r = .35$, $p < .001$), having the DVR learn the respondents' favorite shows ($r = .26$, $p < .001$), and grazing over fewer channels ($r = .25$, $p < .001$).

Also, the item that measured DVR enjoyment was correlated with feelings of control ($r = .54$, $p < .001$), recording shows at inconvenient times ($r = .42$, $p < .001$), and overall satisfaction ($r = .35$, $p < .001$).

Finally, the item that measured feelings of greater control with the DVR was associated with recording shows at inconvenient times ($r = .40$, $p < .001$), watching fewer commercials ($r = .51$, $p < .001$), grazing over fewer channels ($r = .41$, $p < .001$), and zipping past commercials ($r = .24$, $p < .001$). Having a larger channel repertoire, however, was negatively correlated with control ($r = -.33$, $p < .001$) and enjoyment ($r = -.25$, $p < .001$).

DISCUSSION

From these exploratory findings, it appears that early adopters of DVRs are quite fond of using them. DVR owners reported watching typical amounts of television, but with more enjoyment and greater control. Even though respondents in

this study do not time shift very much, it seems that they really appreciate being able to do it more easily with the DVR than with their VCRs. Timeshifting is the feature that was linked to most measures of satisfaction.

The data show a positive relationship between use of the DVR and enjoyment with television. All the features except for slow motion are linked to some measure of satisfaction. Perhaps taking longer to watch video segments with slow-motion is not viewed as a satisfying way to watch television. Future research should explore how effort and activity are linked to enjoyment of technology.

These DVR owners are clearly early adopters (Rogers 1995), so they are not typical of the population as a whole. They are probably better educated, make more money, and perhaps might even be opinion-leaders, although these variables were not measured in this study. Future research should explore DVR owners over time to explore how the demographics, social characteristics, and even attitudes about television change. Length of ownership is likely to play a factor, as it has done with VCR research (see Klopfenstein, Spears, and Ferguson 1991).

The increased time-shifting functionality of TiVo and ReplayTV suggests that the DVR will eventually displace the VCR and enhance the new DVD recorders. Among the most valued features of the DVR is the ability to record programs that are aired at inconvenient times. It is clear that DVR owners find their new machines much easier to use than the VCR.

Perhaps the real significance of studying DVRs now is that these stand-alone devices are quickly evolving into integrated solutions for delivering multichannel services to set-top boxes. The direct-to-home satellite services already offer the DISHplayer and the DirectTV-TiVo receivers, with cable system operators (e.g., Comcast) test-marketing DVR services (Amdur 2003). It makes sense for a cable operator to move some of its video-on-demand program content to secure home-based storage, away from centralized disk space. When all 92.2 million cable and satellite million homes (NCTA 2003) eventually have DVR capability built into their set-top boxes in the not-too-distant future, the changes in viewing/recording behavior studied here will become even more important to the study of television viewing behavior.

This study is, of course, limited by the nature of the self-selected samples. Familiarity with web surfing in a sample recruited on the Internet may have biased the amount of

reported channel use on television. The mostly-male forum participants likely reflect viewpoints of the aficionado rather than the causal user. Lindstrom (1989) noted that early adopters of the VCR were heavy TV viewers. He observed, "In general, recording activity follows TV activity, with lighter television usage roughly translating into lighter VCR recording activity" (p. 44).

The ultimate importance of studying DVRs lies in the threat these devices pose to advertisers whose messages will become easier to avoid as viewers learn to manipulate real-time. Although Mandese (2004) argues that DVRs enhance advertising in some settings, most industry observers (e.g., Gough 2003; Mermigas 2003a) fear the worst for the advertiser-supported model of television, especially as national DVR penetration is predicted to reach at least 15 percent by 2006 (Mermigas 2003b). Future research should look at the economic impact of altered viewer behavior, if only to track the rate of diffusion, changing uses over time, and whether the novelty will wear off. Whether DVRs themselves will remain viable stand-alone devices or not, we cannot predict. But it is clear that the added functions are here to stay, in some form or another.

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